REMARKS

Reconsideration and withdrawal of the rejections made in the mentioned Office Action are respectfully requested, in view of the following remarks.

Summary of Office Action

Initially, Applicants note with appreciation that claims 85-111 have been allowed.

Claims 56-63, 66-71, 73-77, 83, and 84 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Nawata et al., U.S. Patent No. 5,305,522 (hereafter "NAWATA").

Claims 56-63, 66, 68, 69, 71, 73-75 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over EP 665068 A1 (hereafter "EP'068").

Claims 76, 77, 83, and 84 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over EP'068 in view of NAWATA.

Claims 64, 65, 72 and 78-80 are objected to as being dependent upon a rejected base claim, but are indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Office Action

Reconsideration and withdrawal of the rejections of record are respectfully requested.

Response to Rejection of Claims under 35 U.S.C. 103(a) over NAWATA

Claims 56-63, 66-71, 73-77, 83, and 84 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over NAWATA. In this regard, the rejection essentially repeats the allegations in the previous Office Action. In particular, the rejection acknowledges that NAWATA fails to teach a) the amount or distribution of precipitated graphite particles, b) the amount of precipitated eutectic and monocarbides, and c) the Shore C hardness recited in independent claims 56 and 76, respectively, but maintains that it would have been obvious to one of ordinary skill in the art to determine the optimum values of a) and b), because NAWATA allegedly teaches in column 2, lines 7-16 thereof that graphite and carbide precipitates depend on composition and cooling rate and that poor wear resistance and surface roughening occur when too many graphite particles and too few carbide particles are present. Applicants note that the detailed counter-arguments set forth in the Amendment filed October 3, 2003 (which counter-arguments are fully incorporated herein) are not specifically addressed in the present Office Action. On page 8, the Office Action merely refers to col. 1, lines 10-11 and col. 1, line 68, to col. 2, line 4 of NAWATA and asserts that this document allegedly teaches that the population of graphite and carbide precipitates are result effective variables (wherein the recognized result allegedly is wear resistance and surface roughening) wherefore it would allegedly have been obvious to one of ordinary skill in the art to determine the optimum or workable ranges of said variables.

As already set forth in the response to the previous Office Action, Applicants respectfully disagree with the Examiner's analysis of NAWATA and the conclusions drawn therefrom for at least the following reasons.

The response to Applicant's counter-arguments with respect to the rejection of the claims over NAWATA refers to the following statements in NAWATA:

"the high-alloy cast iron is a material in which graphite particles are inherently likely to be precipitated" (col. 2 lines 3-4);

"the shell portion of the compound roll is required to have an increasingly finer metal structure with higher uniformity" (col. 1, line 68 - col. 2, line 2) which is obtained by centrifugal casting at a high cooling speed (allegedly disclosed in col. 1, lines 10-11).

It is not seen how the above statements relate to, let alone suggest, the importance of the number and/or volume fraction of the graphite particles in the shell portion of the compound roll of NAWATA. In fact, Applicants could not find any statement in NAWATA which may reasonably be related to the volume fraction of the graphite particles. Further, the only statement that may at the first glance be considered to refer to the number of graphite particles, appears to be in col. 2, lines 3-16 of NAWATA where the following is stated:

> The high-alloy cast iron is a material in which graphite particles are inherently likely to be precipitated. Accordingly, in the case of forming the shell portion from the high-alloy cast iron, a surface portion of the shell portion not only has a fine metal structure but also contains fine graphite particles and a fine carbide phase by the rapid cooling action of the mold. However, since the rapid cooling action of the mold decreases inside the shell portion, the metal structure becomes coarser and the amount of graphite particles precipitated increases while the amount of the carbide phase decreases. As a result, in the

> deep area of the shell portion, which is to be exposed by several times of machining, it shows poor resistance to wear and surface roughening.

Emphasis added. Accordingly, what one of ordinary skill in the art may possibly infer from the above passage of NAWATA without taking into account the disclosure of this document in its entirety is that poor resistance to wear and surface roughening are the result of one or more of the following events: the metal structure becomes coarser; the amount (related to the number ?) of precipitated graphite particles increases; the amount of the carbide phase decreases. However, at col. 7, lines 24-44, NAWATA clarifies which property of the graphite particles affects wear resistance:

> It is preferable that the graphite particles in the metal structure of the shell portion have an average diameter of 65 μm or less in a range from a surface to a depth of 50 mm when determined by an image analysis method on the graphite particles having diameters exceeding 28 μm. If the average diameter of the graphite particles is larger than 65 μm, good wear resistance and resistance to surface roughening, which are required to the shell portion, cannot be achieved, failing to produce high-quality rolled sheets.

Emphasis added. Accordingly, NAWATA does not leave room for speculation as to which property of the graphite particles affects wear resistance and resistance to surface roughening: it is the average diameter thereof (which should not be larger than 65 μm). In view of this clear and explicit teaching of NAWATA, one of ordinary skill in the art would not have been motivated to consider any other property of the graphite particles such as, e.g., the number or the volume fraction thereof. NAWATA simply does not provide any basis for

an expectation of success in connection with an optimization of the number **or** the volume fraction of the graphite particles, let alone an optimization of the number **and** the volume fraction of the graphite particles. In other words, neither number nor volume fraction of the graphite particles are indicated to be result effective variables. Accordingly, NAWATA does not render obvious the subject matter recited in the rejected claims for this reason alone.

Additionally, with respect to independent claim 76 it is noted that NAWATA does not appear to contain any disclosure as regards the volume percentage of carbides, let alone (a) the volume percentage of eutectic carbides and (b) the volume percentage of carbides of V, Nb and/or Ta. According to the paragraph bridging pages 4 and 5 of the present Office Action, the Examiner takes the position that NAWATA allegedly teaches an overlapping alloy composition and that, "substantially the same graphite and carbide compounds are expected to occur for the substantially overlapping alloy taught by Nawata". However, as can be taken from NAWATA itself, the "amount" of carbides formed depends, at least in part, on the process (cooling) conditions, i.e., not only on the composition of the alloy ("However, since the rapid cooling action of the mold decreases inside the shell portion, the metal structure becomes coarser and the amount of graphite particles precipitated increases while the amount of the carbide phase decreases." Col. 2, lines 9-13 of NAWATA). Accordingly, the rejection of claim 76 and the claims dependent thereon over NAWATA is not justified also for this reason.

In view of the foregoing, there appears to be no need to comment on any of the Examiner's additional allegations regarding NAWATA. However, this is not to be construed as Applicants' admission that any of these other allegations are of merit.

In conclusion, Applicants submit that at least for the reasons discussed above, withdrawal of the rejection of claims 56-63, 66-71, 73-77, 83, and 84 under 35 U.S.C. § 103(a) as obvious over NAWATA is warranted, which action is respectfully requested.

Response to Rejection of Claims under 35 U.S.C. 103(a) over EP'068

Claims 56-63, 66, 68, 69, 71, 73-75 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over EP'068. In this regard, the rejection essentially repeats the allegations in the previous Office Action, which allegations have already been addressed in the Amendment filed on October 3, 2003. Applicants' corresponding arguments are expressly incorporated herein.

The Office Action acknowledges that EP'068 fails to teach the number and distribution of graphite particles as recited in the present independent claims, but again asserts that in view of the allegedly overlapping area ratios, the number of particles per mm^2 is expected to overlap.

Applicants respectfully traverse this rejection. In particular, it is to be taken into account that the area ratio of the graphite particles (0.5-5 %) given at, e.g., page 4, line 47 of EP'068 in combination with the particle size range of 5-50 μm indicated at page 4, line 50 of EP'068 results in the following maximum and minimum values of the graphite particles per mm^2 according to EP'068 (assuming a circular cross-section of the graphite particles):

Minimum value:
area ratio 0.5 %; particle size: 50 μm
area per particle: 25 x 25 x 3.14 μm^2 = about 1,960 μm^2
0.5 % of total area: 0.005 x 1,000,000 μm^2 (1 mm^2) = 5,000 μm^2
Minimum number of particles/mm^2: 5,000/1,960 = **2.55**

Maximum value:
area ratio 5 %; particle size: 5 μm
area per particle: 2.5 x 2.5 x 3.14 μm^2 = about 19.6 μm^2
5 % of total area: 0.05 x 1,000,000 μm^2 (1 mm^2) = 50,000 μm^2
Maximum number of particles/mm^2: 50,000/19.6 = **2,551**

Accordingly, based on the ranges indicated in EP'068 the number of graphite particles per mm^2 can be anywhere between about 3 and about 2500. Even with the preferred area ratio range of 2-4 % (see page 4, lines 49/50 of EP'068), the number of graphite particles per mm^2 would still range from about 10 to about 2000. Accordingly, what one of ordinary skill in the art can infer from EP'068 is that virtually any number of graphite particles per mm^2

is acceptable as long as the area ratio thereof is in the range of 0.5-5 % . While the extremely broad range for the number of graphite particles that can be inferred from EP'068 would, of course, encompass the corresponding ranges recited in the present claims, EP'068 does not provide any teaching or suggestion that it may be worthwhile to adjust the number of graphite particles within a certain range to thereby improve any property of the roll for hot rolling discussed therein, thereby failing to provide any motivation to one of ordinary skill in the art to optimize the number of graphite particles. In other words, EP'068 does not disclose the number of graphite particles as a result effective variable. EP'068 does not even specifically address the number of graphite particles. The only property of the graphite particles other than their area ratio (amount) that is mentioned in EP'068 is their size, not their number. Without knowledge of the present invention, one of ordinary skill in the art would not even have been motivated to calculate the range for the number of graphite particles on the basis of the area ratio and size ranges recited in EP'068. However, even the size of the graphite particles is not emphasized in EP'068 as a particularly important variable. For example, none of the claims of EP'068 makes any reference to the particle size.

What one of ordinary skill in the art would infer from EP'068 is that it is only the amount of graphite, but not the number of graphite particles, that one needs to be concerned about. For example, in the description of the process used for making the roll, EP'068 states:

...during the formation of the outer layer an Si-containing inoculant is injected

> by means of wire-injection method into a vicinity of the bonding portion of the melt and the steel shaft to crystallize graphite particles in a sufficient amount.
>
> Emphasis added. Page 4, lines 22-24. See also claim 13.
>
> With this so-called wire-injection method, the resulting solidified outer layer 8 contains a sufficient amount of crystallized graphite particles.
>
> Emphasis added. Page 8, lines 3-4.

It is noted that at the bottom of page 8 of the present Office Action, it is alleged that "EP'068 teaches that it is known that the crystallization of graphite particles, which serve as solid lubricants, improves seizing resistance in a roll (page 3 lines 19-20)". However, if anything at all, this might possibly be taken as a motivation to maximize the number (if not just the amount) of graphite particles. This is not what is recited in the present claims, and is yet another reason why EP'068 does not render obvious the subject matter of the rejected claims.

In view of the foregoing, there appears to be no need to comment on any of the Examiner's additional allegations regarding EP'068. However, this is not to be construed as Applicants' admission that any of these other allegations are of merit.

Applicants respectfully submit that for at least the foregoing reasons, EP'068 does not render obvious any of the subject matter recited in claims 56-63, 66, 68, 69, 71, and 73-

75. Accordingly, the rejection of these claims under 35 U.S.C. § 103(a) as allegedly unpatentable over EP'068 is not justified and should be withdrawn, which action is respectfully requested.

Response to Rejection of Claims under 35 U.S.C. 103(a) over EP'068 in view of NAWATA

Claims 76, 77, 83 and 84 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over EP'068 in view of NAWATA. The rejection essentially repeats the allegations in the previous Office Action.

Applicants respectfully traverse this rejection for at least the same reasons as stated above with respect to the claim rejections over NAWATA and EP'068 individually. In particular, none of these two documents teaches or suggests that both the number and the volume percentage of the graphite particles, in combination with the additional parameters recited in independent claim 76 and the claims dependent therefrom, need to be controlled for achieving a satisfactory performance of the corresponding roll. In view thereof, there appears to be no need to comment on any of the Examiner's allegations regarding the combination of EP'068 and NAWATA. However, this is not to be construed as Applicants' admission that any of these allegations are of merit.

For at least the foregoing reasons, withdrawal of the rejection of claims 76, 77, 83 and

84 under 35 U.S.C. § 103(a) over EP'068 in view of NAWATA is respectfully requested.

Response to Objection to Claims

Claims 64, 65, 72 and 78-80 are objected to as being dependent upon a rejected base claim, but are indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. At least for the reasons discussed above, Applicants believe that the rejection of the base claims is not justified and should be withdrawn, wherefore it does not appear necessary to take any action with respect to any of the dependent claims.

CONCLUSION

In view of the foregoing, it is believed that all of the claims in this application are in condition for allowance, which action is respectfully requested. Applicants' representative will take the liberty to contact the Examiner by telephone after the Examiner has had an opportunity to consider Applicants' arguments in order to discuss any issues which may still need to be resolved.

P21259.A06

Respectfully submitted,
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